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PSYCHOLOGY AS BEHAVIORISM.

I.

A characteristic of the knowledge that is called science is that it is *organized.* A number of disconnected facts, however large, is not a science; though, if the number be very large, the facts will not be altogether disconnected, things being as they are. How much connexion there ought to be if a group of facts is to be called a science, it is impossible to say, partly because there is no precise method of determining degree of connexion, and partly because *accuracy* also is a characteristic of scientific knowledge. Thus, the term science may be applied to "facts" if their accuracy is great though their interconnexion is small, or to "facts" whose interconnexion is great but whose accuracy is doubtful. While accuracy is certainly important, the degree of interconnexion is always of the very greatest theoretical interest. This interconnexion is expressed in principles, and hence, in science, discussion of principles is a highly important task. Its relevance in psychology is especially great at the present time. Any serious attempt to formulate psychological principles or to estimate the adequacy of proposed principles; to organize, for instance, the large number of empirical facts which experimental psychology has collected and is still collecting, or those other facts, bidding fair to be still more numerous, which are being brought to the light of day by psychoanalysis; any such attempt is worthy of consideration, largely on its own account, that is, because principles are essential to science. But at the present time, the psychologist who possesses a conscience at all metaphysical,—who proceeds at all metaphysically in the sense that he tries obstinately to think clearly and consistently,—tends to wince at formulations of psychological principles which seem to manifest, not merely haste, which is natural enough in so commercial an era, but an almost incredible innocence of metaphysic. The present psychological situation, in brief, is one in which principles of psychology deserve special attention.

II.

By Behaviourism is here understood the theory of the subject matter and methods of psychology which has been expounded most fully by Prof. J. B. Watson. This theory consists essentially of two propositions:

1. The subject matter of psychology is behavior exclusively;
2. Behavior is scientifically explicable without reference to what are commonly called mental facts or processes.

Definitions of Psychology.—Modern definitions tend to say that the subject matter of scientific psychology is mental states, processes or phenomena. Thus, James followed Ladd in defining psychology as the "description and explanation of states of consciousness as such."[1] Ward, it is true, in explanation of what he means by saying that the subject matter of psychology is "individual experience" states that "individual experience" is meant to indicate "above all conative activity or behavior"[2]; but, though this explanation would seem to suggest more than a verbal difference between his definition and that of James, the exposition of the science by the two psychologists makes

[1] E. g., *Text Book,* p. 1.

[2] *Psychological Principles,* p. 28.

it clear that the problems regarded as providing the subject matter of psychology are much the same for both of them, and that the differences in their definitions are largely verbal. We need to be told, no doubt, that "individual experience" is intended to mean "above all, conative activity or behavior"; but, equally, we need to be told why instinctive behavior should monopolize a considerable section of a work devoted to the investigation of "states of consciousness as such." Again, some years ago, McDougall stated that psychology might be *best and most comprehensively defined* as the positive science of the conduct of living creatures.[3] But he presently discussed, as psychological questions, the attributes of sensation and feeling tone of images; showing, at least, that his definition did not comprehend the whole of the subject matter of the science, while his general exposition indicated this subject matter to be much the same for him as for James and for Ward, notwithstanding the special direction of his attention to certain problems.

The fact is that definitions of psychology are generally framed so as to emphasize some neglected problem or method, and that no definition yet offered of the subject matter of the science suggests, in a natural way, and without further explanations, the variety of problems the science includes. This is not said in criticism but stated as a fact. It suggests that the actual subject matter of psychology is a number of problems, which can be enumerated one by one, but which present sufficient diversity to make a brief and precise definition of the science extremely difficult, if not, in the logical sense of definition, impossible. It is thus to be expected that verbal definitions of the subject matter of psychology should be inadequate. If they begin by emphasizing consciousness, they will find it difficult, in the end, to include conduct; and if they begin by emphasizing conduct, they will find it difficult, in the end to include states of consciousness.

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[3] *Physiological Psychology*, p. 1.

The Behaviorist Definition.—The behaviorist definition endeavors to attain adequacy by elimination: it restricts the scope of the science, and excludes certain traditional problems. For when the behaviorist defines the subject matter of psychology as behavior, he does not intend this to be interpreted to mean much the same as is meant by James or Ward in their definitions. When he says behavior, he *means* behavior and *nothing but* behavior. "The time seems to have come" says Professor Watson, "when psychology must discard all reference to consciousness." (*Behavior,* p. 7). Again: "It is possible to write a psychology. . . and never to use the terms consciousness, mental states, mind, content, will, imagery and the like" (*ibid,* p. 9.). This can be done "naturally and conveniently" in terms of behavior. The behaviorist maintains that he does not know what such terms as perception, sensation, image and feeling, mean.

He knows, however, what is meant by behavior. This is the "total striped and unstriped muscular and glandular changes, which follow upon a given stimulus."[4] The stimulus need not originate in the space external to the body, for muscular and glandular changes within the body may themselves act as stimuli to further muscular and glandular changes. But, however caused, these "reactions" are identical with "behavior," and make up the subject matter of psychology (*Psychol. Rev.* 1917, p. 336).

Although this conception seems to restrict the field of psychology in a somewhat startling manner, it leaves it sufficiently large to allow for active research. The behaviorist begins with the child as soon as it is born,—or, more accurately, as soon as breathing is established. At this stage, he attempts to determine what reaction tendencies are *instinctive*: for example, whether the new-born infant possesses innately the neuro-muscular coordinations required for swimming. A small bath of water at body temperature is held in readiness, and (when breathing is established) the infant is slowly lowered into it supported on its back by the experimenter's hands. When this experiment was performed, the particular infant who acted as subject manifested violent signs of fear but no coordinated swimming movements.[5] Clearly numerous experiments of this sort are conceivable.

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[4] Watson's *Psychology,* p. 14.

The infant is then followed through childhood to adulthood with appropriate experiments at each stage. The behaviorist tries to determine, for instance, what are the reactions of a six-months old infant to living furry animals. It is therefore held by its mother in a well-lighted room and shown successively a white rat, a dog, a cat, a white rabbit, beetles and a snake,—its responses to the various objects being noted and subjected to analysis.[6] Much information about human instincts may be acquired by such experiments. But in addition to innate reaction tendencies there are those that are acquired,—problems of habit or learning; and here the field is very wide.

And the apparent restriction of the scope of psychology is not so great as it would, at first sight, appear to be, because certain problems which it might seem would be excluded, are so modified as to be included. Thus the behaviorist includes all problems connected with the range of sensory stimulation. To determine the *range of visual sensibility*, for instance, is a behaviorist problem. But the subject is never to be allowed to say that he "sees" a light or colour when visual stimuli are directed to his eye. "Ordinarily" says Professor Watson, "we mean when we say that an animal is sensitive to difference in wave-length that such stimuli play a part in the adjustment of the animal to food, shelter, escape from enemies, etc., *i. e., that such stimuli initiate activity in arcs which end in striped muscles.*"[7] And so, in experiments, the visual stimulus is *made* to initiate activity in arcs ending in striped muscles. This is achieved by the creation of a *conditioned reflex.* The subject rests his hand upon an electrode, and, to begin with, whenever visual stimuli well within the range of "visibility" are presented, a shock is given, which causes the subject to move his hand. By the repetition of this process, it soon comes about that, when a light is "seen," the hand is moved in a characteristic manner, even when no shock is simultaneously given. And the experimenter can, at this point, take the movement as a sign that a color or light is "seen" (or that the given stimulus is among those that play a part in the adjustment of the subject to food, shelter, etc.). There is no need in such a procedure to use the troublesome word "saw" (or "see"); there is no need for the subject to speak at all. The experimenter knows that, when the characteristic movement of the hand does not occur, the visual stimulus is outside the range of visibility (provided, of course, that the conditioned reflex has not temporarily broken down through fatigue or some other cause, *and that the subject was attending when the stimulus was given.*)

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[5] Watson's *Psychology*, p. 243.

[6] *Psychol. Rev.* 1917, pp. 343-344.

The behaviorist, then, whatever be his difficulties, is not likely to suffer from lack of problems to investigate. Further, his problems are psychological problems, for they are of the types that find a place in standard expositions of the science; if these were appropriately called psychological before, there can be no reason to deny them that title now. Further still, there can be no real objection to the behaviorist applying the term psychology to these problems exclusively. That, in itself, might be a matter of taste and convenience in the use of words, and all that it seems reasonable to say is that the current and traditional usage of psychology is different from this.

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[7] Watson's *Behavior,* p. 354.

But the complication is not simply verbal. Professor Watson says, no doubt, that his conception of psychology excludes many problems with which psychology has been historically concerned;[8] that he does not know what such terms as image, feeling and will mean, and that he can get along quite well without these terms. But he does not mean that he is dividing to conquer; that the excluded problems are genuine enough and that the discarded terms have genuine reality as their meanings; that he has not adequate time, or perhaps interest, to investigate these problems, and so will limit his field. He is not like the artist who says "My work is Art," or the scientist who says (to the artist) "My work is Science." It is rather as though the artist said to the scientist: "There is no such thing as science." For the behaviorist denies the existence of any mental reality. It is not easy to say what is the relation of his position to the later views of James or to the view of the American new-realists; but it is not difficult to determine what the position is in itself. It becomes unambiguous in the form that the only phenomena which could be called mental are muscular and glandular changes. What is to be said of this theory?

III.

Among the phenomena commonly called mental are images and feelings, and these may be used to illustrate an argument which can be applied equally well to *all* "mental" phenomena. The behaviorist must say either that images and feelings do not occur at all, or that, occurring, they are identical with muscular or glandular changes. Now the empirical evidence for the occurrence of images and feelings is final. If the behaviorist raises a doubt, the answer is that this evidence is as convincing as the evidence for the occurrence of muscular and glandular changes We observe the one sort of phenomena as assuredly as we do the other. Taking the *occurrence* of images and feelings, then, as beyond doubt, the behaviorist's position must be that these are identical with muscular or glandular changes.

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[8] *Psychol. Rev.*, 1917, p. 336.

Against this view, the evidence is also conclusive. And this evidence is again of the type admitted, though not discussed, by the behaviorist: it is observation. We need not consider here how much is involved in observation,—for instance, to what extent it requires judgment. It may be taken and used here as it is taken and used by the behaviorist. Muscle movement, for instance, is something that the behaviorist *observes*. He "sees" it when someone crooks his finger or swings a racket. It is important that the behaviorist bases his position upon observation, and that he does not mean, for instance, by a muscular change, certain spatial changes in the relationships of certain ultimate constituents of matter. No: the muscular or glandular change is a straightforward sort of thing. We can observe both it and its effects.

We have thus to compare what we observe when we say we observe behavior with what we observe when we say we are aware of images or feelings, and to ask whether what we observe in the one case is identical with the object of our observation in the other. The answer is most positively that the two are *not* identical. It is *as clear* that a muscular or glandular change is not an image or a feeling *as* that a muscular movement is not a glandular change. The evidence is of precisely the same sort in the two cases. We perceive in both cases that the objects under comparison are different. There is no more reason to say that an image or feeling is identical with a muscular or glandular change than there is to say that the two latter are identical; and there is *at least as much* reason for denying identity in the one case as in the other. Of course, if our judgments of difference are all false; if tables are identical with chairs and anything is identical with anything else; then images and feelings may be identical with muscular or glandular changes. But we must surely accept our experience of difference as valid until it is demonstrated to be invalid; and the point is that here is a judgment of difference that has not been shown to be invalid.

The same argument applies to all the phenomena currently recognized as mental. The question does not here arise whether images and feelings are *conditioned by* glandular or muscular changes: our question concerns their identity.

IV.

In one instance the behaviorist has attempted *to demonstrate* identity between a phenomenon traditionally regarded as mental, and behavior as defined by himself. This mental phenomenon is thinking. The behaviorist is forced to consider thinking in detail because of the phenomena of delayed reaction. Whenever a response follows relatively immediately upon a stimulus, it is plausible to say that the "sufficient" explanation of the response is this stimulus. But response and stimulus are sometimes separated by considerable intervals of time during which thinking "goes on." It is necessary for the behaviorist to reduce this intermediate activity of thought to muscular and glandular changes.

The evidence adduced to show that thought is identical with certain behavior, as above defined, is of two sorts. (1) The first attempts to show that, when we think silently, movements of the speech muscles occur. The experimental work of the behaviorists in this connection is of considerable interest, and will, eventually, in all likelihood, prove still more interesting; but its value as evidence is exactly nil. *In the first place,* the experimenters have had to admit that in some cases of silent thinking, present experimental technique has been inadequate to indicate any muscle movements of the speech mechanism. To this it has been said that present apparatus is faulty and that further refinement of method should give better results, which is true enough; also, that when the apparatus did not show muscular movements during silent thinking in the *speech* mechanism, it was possible that the thinking was then being carried on by movements of *other* muscles in the body. For while the speech muscles are the ones most generally involved in thought, others are not excluded from functioning similarly, and it is, in a way, accidental that thought is constituted by movements of the speech muscles. All which, being so largely supposition, is valueless as evidence. *And secondly,* nothing whatever as to the identity of thought and behavior would be proved even if it were established that muscular changes in the speech mechanism *always* occurred during silent thought. It might simply be a case of concomitance, like a man and his shadow.

Behaviorism admits the weakness of the above line of evidence, and attempts another. (2) This second sort of evidence consists of an attempted reconstruction of the first processes of thinking in the child. Such reconstructions as this are usually not convincing, though the present case is not so bad as those that concern primitive man; but putting this aside, we may consider the present case on its merits.

The general theory is that thinking consists in the fact that certain behavior, *generally* movements of the speech muscles, *operates as a substitute* for other behavior. Thus, the man who excogitates a new aeroplane engine is doing, primarily with his speech muscles, what he could do equally well, if less conveniently, with the muscles of his arms, legs and trunk. If he were to make the engine by movements of the latter muscles, in simple response to stimuli in the environment, he would not engage in thought at all; but when he sits at his desk apparently motionless, thinking the matter out, movements of his speech muscles are substituted for those of his arms, legs and trunk, and in this substitution we are to see the essence of thought. Although the motionless thinking man may appear to be physically inactive, the muscles of his speech mechanism are as full of movement as his arms and legs would be if he were playing tennis.

This substitution of movements for movements occurs on the principle of the *conditioned reflex*. If a hungry dog be shown food, his salivary glands will become active and secrete. Powlow found that if a dog were repeatedly given another stimulus simultaneously with the sight of the food, the second stimulus soon caused activity of the salivary glands in the complete absence of food. A *conditioned reflex* had been established. In the case of thought, the conditioning reflex is constituted by movements of the large muscles of the body in response to environmental stimuli: the movements of the speech muscles are the commonest of the conditioned reflexes. When we try to see this process in mature thought, the task is doubtless a difficult one. Let us, however, follow the behaviorist[9] as he attempts to show that the earliest processes of thought are simply *conditioned reflexes*.

V.

In the development of the earliest act of thought, as this is described by Professor Watson, six stages may be distinguished.

1. First, habits are formed which, though vocal, are not language habits: they do not constitute genuine

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[9] *Cf.* Watson's *Behavior*, pp. 328-331.

thought. They originate as responses, imitative in form, of external stimuli chiefly, though doubtless to some extent they are due to intra-organic stimulation, the infant instinctively uttering certain noises. The sound of a word is a stimulus to the infant to utter it, and a hundred or more words may be acquired in this way. This is the parrot stage, and no thinking is involved in it.

2. In the second stage, the child has acquired, in addition to the foregoing vocal habits, a number of others involving the exercise of arms, hands, legs and trunk. Movements of these parts of the body regularly occur in response to specific stimuli in the environment. The child *grasps* its rattle, for instance, and *shakes* it. Habits of this sort, that is, habits involving the exercise of arms, hands, legs and trunk are considered essential for the development of thinking. A paralytic child, apparently, could never think. So far there is no essential difference between the child and the parrot: both have acquired habits of moving the larger parts of the body and both can emit sounds.

3. The next step is held to carry the child to a plane as yet reached by no animal save man.[10] It is described somewhat as follows . The nurse, observing the child to react characteristically to a certain object, say a ball, says "ball" whenever this reaction occurs. The spoken word acts as stimulus to the child to utter it in accord with stage (1). The repetition of this procedure produces a conditioned reflex. To begin with there are two stimuli (or groups of stimuli), (*a*) the sight of the ball, (*b*) the spoken word ball (spoken by nurse); and two

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[10] *Ibid.*, p. 329.

responses, (*a*) arm, leg and trunk movements to the sight of the ball, (*b*) speech muscle movements necessary to say "ball" in response to that word as spoken by the nurse. Hence, the child presently makes both responses to the mere sight of the ball: when it sees the ball, it moves its arms, legs and trunk suitably, and at the same time says "ball."

It may be remarked in passing that all this appears to find a perfectly satisfactory and straightforward explanation in terms of association. Not that the behaviorist denies this; but why does he say that no animal save man has reached this stage? It is certainly true, at any rate, that conditioned reflexes can be produced in lower animals.

4. The essential fact in the fourth stage is that many instances occur in which the early arm and leg responses to specific stimuli are frustrated: for instance, the ball is on a shelf and cannot therefore be grasped, or rolled along the floor. Two responses have been established to the sight of the ball, the arm, leg and trunk movements, and the word "ball"; when one is frustrated only the other occurs. Hence, in many instances the uttered names of objects are the only responses made to them.

5. The fifth stage, not clearly distinguishable from the fourth, seems to consist of the results of numerous particular cases such as that indicated in the fourth stage. The greater frequency with which the uttered word response to objects occurs, tends to establish that response to the exclusion of others. Note broadly what has happened. Movements of the speech muscles have been "substituted" for move-

> ments of arm, leg and trunk muscles, and thinking, identical with this substitution, has begun.
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> 6. The final stage in the development is the occurrence of the word without the stimulus of the ball. But this presents no difficulty. Many objects have been seen along with the ball, and by association the sight of any one of these may excite the response,—spoken word "ball." The stimulus may even be intra-organic. As the network of associations is rapidly woven by early experience, it is soon possible for any one of a multitude of stimuli to give rise to word responses.
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> And thus we have reached "true language habits," *that is,* thought. Presently, the vocal gives way to subvocal thinking, owing to demands of the social environment; the movements of the speech muscles become more refined, and are modified variously, so that words are not now *uttered* in thinking. But nothing new in principle is involved in the subvocal use of the complicated structure of language as we know it.

Any plausibility this theory possesses is due to two factors; its emphasis upon the muscular movements *connected with the uttering of words,* and its assertion that we have, in thinking, essentially a "substitution" of certain muscle movements for others.

Concerning the first of these points, the recognized actual close connection between words and normal thinking is here a cause of some confusion; but the behaviorist maintains that the essence of the matter is the *substitution* and *not* the particular muscles involved. It is not necessary that the substituted muscle movements should be movements of the speech muscles.[11] Any other muscles will do as well, provided only that there is muscle movement substitution generated by conditioned reflexes. Where does this lead us? Let us, in a perfectly legitimate way, trace the development of early thinking in a hypothetical case in which the substituted muscles are *not* those of the speech mechanism. We shall have six stages, as before.

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[11] *Cf. Behavior,* p. 325. (The reference to *"bodily language"* habits).

1. As the speech muscle movements are to be excluded from this process, we shall not begin with the vocal non-language habits but with others. Let us suppose that at a very early date in its life, an infant acquires the habit of withdrawing its right foot on the application to it of an electric shock. We begin, that is to say, with stimulus and response, as Professor Watson does, the difference being simply that our response and stimulus are different from his,—chiefly in the fact that responding muscles are different. (The one case considered may be taken as representative of a whole class of similar cases).

2. In the second stage, the child has acquired a number of habits involving the exercise of arms, legs and trunk. Let us suppose that one of these is the withdrawal of the left foot when touched by a cold object.

3. This step is very important. The nurse, observing the child to withdraw its left foot upon its being subjected to a cold stimulus, decides to give the right foot an electric shock whenever a cold stimulus is applied to the left. This is exactly similar to the situation in which the nurse, when she sees the child make a characteristic response to the sight of the ball, says "ball." And, in each case, the nurse's procedure provides a stimulus to the infant. In Professor Watson's case, the child says "ball": in

the present case, it withdraws its right foot. Here, to begin with, there are two stimuli, (*a*) cold stimulus to left foot, (*b*) electric stimulus to right foot; and two responses, (*a*) withdrawal of left foot, (*b*) withdrawal of right foot. Hence, the child presently makes both responses when the electric stimulus is alone applied. That is, as response to the electric stimulus applied to the right foot, the child now withdraws *both* feet; just as it comes both to say "ball" and make appropriate arm, leg and trunk movements at the mere sight of the ball. *A conditioned reflex has been established.*

4. The essential fact in this stage is the frustration of one of the two responses. Let us suppose the infant's right leg becomes paralyzed: this would correspond to the case in which, in Professor Watson's account, appropriate responses are prevented because, for instance, the ball is on a shelf out of reach. What happens now when the electric shock is applied to the right foot? *The child withdraws its left foot only.*

5. This stage will be constituted by the results of many particular processes in the organism similar in principle to that described (in which one movement has been substituted for another), thus giving us many instances of *thought.*

6. The final stage is the withdrawal of the left foot at times when the electric stimulus is *not* applied to the right foot. This presents no difficulty. Many objects have been seen at times when the electric shock was given and the left foot withdrawn; and now the sight of any one of these, by associative connections, may cause the withdrawal of the left foot.

The process just outlined contains all the stages of Professor Watson's process, and the laws by which it develops are identical with the laws by which his process develops. The *only* difference is that the particular muscles involved are different. Hence, the behaviorist must admit either that his account of thinking is inaccurate (since he maintains that the speech muscles are not essential to thinking), or that any phenomenon of the kind just described is a case of thinking.

The second alternative cannot be accepted. The reason is briefly this. We are acquainted with thinking, experiencing it as directly as we ever experience muscle movement; and when we compare what we are acquainted with as thought with what we are acquainted with as muscle-movement substitution, we see that the two are *not* identical. They are no more identical than a muscular movement of the right forearm flexor is identical with a muscular movement of the left thigh abductor. The evidence is of the same kind in the two cases,—direct experience. And, let it be said emphatically, it is entirely unnecessary to know everything or even much about thought in order to justify this argument. We may know that red is different from green and not another thing about either. It is psychologically false to suppose that knowledge of difference based upon immediate experience involves any other knowledge.

This brings us to the second reason for any plausibility in the behaviorist's theory of thinking. This, it was said, consisted in the behaviorist's use of the term "substitution" to indicate the essence of his theory. Now, precisely what does the behaviorist mean by muscle movement *substitution?* I may substitute a movement of my right hand for a movement of my left hand in putting on my hat: in short, whenever any purpose realized through the activity of certain muscles comes to be, or happens to be, realized through the activity of other muscles, we may speak of muscle movement substitution. But according to the behaviorist, substitution occurs when, for instance, I *think* of putting on my hat. Nevertheless, when the speech muscle movements associated with (or constitutive of) this thought occur alone, my hat does not get on to my head. Evidently, this sense of substitution is not intended. And, in fact, there is only one sense of substitution which can be legitimately intended by the behaviorist, and this is that which indicates *simply* the phenomena of *conditioned reflex*. Substitution of this sort, however, is *not* the substitution which is actually involved in thinking, and which may be expressed, briefly, as the use of words (or other material) as signs. We know that the behaviorist's theory is wrong because we know that the latter sort of substitution is *not* muscle movement substitution,—however closely muscle movement substitution may be associated with certain forms of it.

VI.

The second proposition of which behaviorism was said (Sect. II) to consist is that behavior is scientifically explicable without reference to what are commonly called mental facts or processes. If the behaviorist were right in his attempted reduction of mental life to muscular and glandular changes, he would of course be right in his second proposition; but this second proposition might, logically, be true, even though his attempted reduction were a failure,—as it is. His position would then approximate to psycho-physical parallelism, and the question would be what new evidence in support of this theory, the behaviorist advances.

It may be said at once that the behaviorist brings forward no evidence in support of the theory that behavior is explicable without reference to mental life, except such as he adduces in support of his position that there is no mental life. Indeed, his second proposition is a corollary to his first. His admission that thinking, in his sense, affects behavior means simply that he inserts certain not very easily observable physiological links in a physico-physiological chain. His first proposition leads him to suppose that the chain has no links that are not either physical or physiological; but he offers no positive evidence that this is so. We may therefore say that the behaviorist has left the body-mind problem exactly where it was.

Two remarks, however, are relevant here. First, we need some criterion of an *adequate* explanation of any given conduct. In the absence of such a criterion, it is easy to offer inadequate as adequate explanations, on the one hand, and to give over-adequate explanations on the other. It would seem to be desirable strictly to limit explanatory facts, in this connection, to those facts from which specific behavior *can be inferred.* In theory this may seem easily possible; but practice here falls far behind the logical ideal. If the behaviorist admits this conception of an adequate explanation, and maintains that he is simply endeavoring to show that the adequate explanation of behavior is physical stimulus plus behavior, we have only to say this: submit the evidence, but do not rely upon *hypothetical* physiological links in the causal chain. Where the links are hypothetical, their nature can hardly be beyond doubt.

Secondly, a good deal of interest attaches to the behaviorist's attempt at a mechanical explanation of the acquisition of motor habits by animals.[12] This is sufficiently interesting on its own account, although whether it has been successful is doubtful. But it is also interesting because of its wider significance. It would certainly be highly interesting if, in a certain case in which the interaction hypothesis has been deemed almost inevitable, it should turn out that this hypothesis is not necessary. If the behaviorist can establish that, he will have made a notable contribution to the principles of psychological explanation.

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[12] *Cf.* Watson's *Behavior,* Ch. VII.

VII.

There remains one further question. The behaviorist is ready to admit that his theory is not established; indeed, he is generally modest concerning *the evidence* for it, and states that he is accepting it *as an assumption,* though a highly reasonable assumption. In face of this position, the obvious question arises: why accept *at all* as true what you do not positively know to be true? In life, no doubt, we must often act on probabilities; but in science the situation is somewhat different. The behaviorist seems to say in answer: I do not make this assumption merely to satisfy my need for believing something, nor for any *practical* reason whatever. It is, on the contrary, accepted merely as a *scientific hypothesis*: behaviorism, in short, is a *hypothesis.*

Now the great respectability of hypothesis in science may lead to the acceptance of this answer without much thought. Hence, the actual situation is likely to cause some surprise when it is realized what it is. It is, in fact, this: there is not the slightest *scientific* reason for making the hypothesis. There is not one of the many very interesting problems with which the behaviorist has concerned himself that could not have been investigated by a scientist who was an interactionist. For instance, it is not necessary to assume behaviorism in order to investigate the extent and character of the muscular and glandular reactions which accompany mental activity, the instinctive neuro-muscular coordinations of an infant, the range of visual sensibility; nor, indeed, for any other *scientific* purpose. If the behaviorist were however to argue that the meaning he attaches to the statement that "behaviorism is a hypothesis only" is that "behaviorism is *probably true*," the answer must be: (1) that the first and fundamental proposition of behaviorism is clearly false; (2) that, concerning its second proposition, the truth or falsity of which may be considered undetermined, behaviorism has adduced no evidence to render it probable.

VIII.

The behaviorist may say (1) that he means merely that *he* is going to investigate behavior, as defined by himself, and will call his investigations psychological. Such a position gives rise to no controversy of a scientific character. Or he may say (2) that all currently accepted mental phenomena are identical with behavior. Such a position is definitely erroneous. Finally, he may say (3) that he will accept, *as hypothesis,* the view that behavior is explicable without reference to any phenomena currently recognized as mental. To which the reply is: there is no *scientific* reason for adopting this hypothesis.

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